

Appendix B

EROSION CONTROL PLAN

EROSION CONTROL PLAN CIRCLE C LANDFILL

In the event of a temporary or permanent closure of the existing landfill cell at Circle C, erosion control measures will be necessary to stabilize the soils on-site prior to the winter rains. The measures outlined below are designed to provide both temporary and permanent control of sedimentation at the Circle C site.

- 1) Revegetation: Establishment of vegetation is the most effective long-term method of controlling sedimentation from bare slopes. Because it requires less maintenance than physical control structures once established, it is especially appropriate for post-closure erosion control. A mix of grasses is used to rapidly establish dense vegetative cover. Hand broadcasting is cost-effective in areas where slopes are not excessive or where soil can be mechanically scarified to hold the seed. Hydroseeding sprays a uniform mix of water, seed and fertilizer over the area to be revegetated and is often used on steep or otherwise inaccessible slopes.

In the Northwest, heavy fall and winter rains can significantly erode seeded areas before enough vegetative growth occurs to protect the soil. If temperatures are lower and germination is delayed, the seed itself can be washed from the slope. Mulching provides physical protection for the soil and seed, as well as enhancing conditions for germination. Seed that does not germinate immediately remains in place to sprout during winter warm spells or the following spring. Straw applied at the rate of 2 tons/acre can provide effective cover. Using sized wood fiber, mulching can be combined with hydroseeding to apply a even layer of mulch over the seeded area. On extreme slopes, a tackifier can be added to the seed/mulch mix, adding cohesive strength to the mulch and creating a spray-on blanket with high resistance to gullyng.

The method chosen to establish vegetation will depend on the timing of the efforts. Hand broadcasting is most effective in late spring or early fall, as germination and growth can occur before heavy rains begin. If seeding must be delayed due to construction activities, a combination of broadcasting, mulching and more intensive methods on sensitive slopes may be required. Costs of revegetation will need to be weighed against other demands for limited closure funds.

The approximate areas to be revegetated is shown on Sheet 2; in practice, all areas bare of vegetation at the time of closure excluding permanent roads will be reseeded.

- 2) Settling Ponds: Sediment production will continue to occur at the site from roadways and from seeded areas until vegetation is established. Settling ponds reduce the velocity of surface flows and hence the sediment load that can be carried by the water. Larger soil particles drop out in the pond rather than in the receiving stream. During large storms, flows exiting the ponds will not be clear, but will contain very fine particles that will tend to remain in suspension.

Circle C will modify the existing on-site structures to maximize their utility as erosion control devices. Both the existing sedimentation pond and the former leachate collection pond will be widened and deepened to increase their holding capacity. Each pond will be equipped with a controlled outlet structure (see details, Sheet 5) to prevent erosion of the outfall and possible breaching. The ponds will be connected in series to maximize detention time.

- 3) Drainage Control: Surface drainage will be controlled to minimize volumes and velocities (and hence erosive potential) of overland flows. All bare areas in the canyon will be graded to drain into one of the two ponds. Flows from the cap will be directed to a catch basin feeding the upper pond, while flows from the lower canyon area will be routed to a similar catch basin feeding the lower pond. The pond outlet ditches will be lined with rock to trap additional sediment and prevent the ditches themselves from becoming a source of erosion.
- 4) Siltation Fencing: As a final barrier to off-site transport of sediment, siltation fencing will be installed below the lower sedimentation pond. This fencing both filters and reduces the velocity of surface flows passing through it, and will be of a finer weave than that currently in place at the site.
- 5) Maintenance: Periodic maintenance will be required to achieve optimum control of sedimentation. Spot seeding may be necessary for areas in which vegetation does not become established. The sedimentation ponds may need to be excavated annually for the first 2-3 years to maintain adequate storage volume, and less frequently as cover is established. Rock ditches may need occasional relining. Sediment deposited in front of siltation fencing may need to be removed once or more a season during the initial period of stabilization.

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PROJECT _____
TITLE _____
CALCULATED BY _____ DATE _____
CHECKED BY _____ DATE _____
SCALE _____ SHEET NO. _____ OF _____

Upper

SEDIMENTATION POND

CIRCLE 41
4-12-90
T.H.T.

Drainage Design, 11 12 & 13 of Catalog

$$Q = C i A = 1.9 \times .35 \times 7.22 = 4.8013 \frac{\text{ft}^3}{\text{s}} \quad \text{For all drainage into catch basin}$$

$$S = 7.7\% = .077 \frac{\text{ft}}{\text{ft}}$$

$$\text{IF } Q = 4.8013 \frac{\text{ft}^3}{\text{s}} \times \frac{7.481 \text{ gal}}{\text{ft}^3} \times \frac{60 \text{ s}}{\text{min}} = 2155 \text{ GPM}$$

$$I.D. = \sqrt[2.67]{\frac{.02271 Q}{S^{1/2}}} = 7.96" \text{ I.D.}$$

For HDPE \rightarrow 8" I.D. \rightarrow 10" P.I.P.E.

(From nomograph)

For Concrete \rightarrow 10" pipe

(From nomograph)

$$Q = C i A$$

$C = .35$ for "pastureland" over 10% - 11th

$i = 1.9$ with 20 min travel time & 25 yr storm

$A = \text{varies}$

Area to North of Service Road (Clay Borrow, etc):

$$A = 6.05 \text{ ac}$$

$$Q = (.35)(1.9)(6.05) = 4.02 \text{ cfs or } 1804 \text{ gpm}$$

Size 11c Pipe - culvert under road into sedimentation pond

1) Slope: IE in: 180, IE out: 165, $\Delta h = 15'$, $L = 100'$ $\therefore 1.5\%$

$$2) I.D. = \sqrt[2.67]{\frac{.02271 Q}{S^{1/2}}} = 6.58" \text{ I.D. } \rightarrow 8" \text{ pipe}$$

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Area South of Service Road

$$Q = C \cdot i \cdot A$$

$$C = .35, i = 1.9, A = 3.56 \text{ ac}$$

$$Q = (.35)(1.9)(3.56) = 2.37 \text{ ft}^3/\text{s}$$

$$2.37 \frac{\text{ft}^3}{\text{s}} \times \frac{7.48 \text{ gal}}{\text{ft}^3} \times \frac{60 \text{ s}}{\text{min}} = 1063 \text{ gpm}$$

Size the pipe:

$$I.D. = \sqrt[4]{\frac{10.47 Q}{S^{1/2}}}$$

where $Q = 1063$ & $S = 7.7\%$

$$I.D. = 6.11" \rightarrow \text{go to } 8" \text{ pipe}$$

Sedimentation:

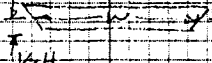
Detention time

$$T_D = \frac{V}{Q}$$

$$1) \text{ Total flow } Q = 4.02 \text{ cfs} + 2.37 \text{ cfs} = 6.39 \text{ cfs}$$

$$6.39 \text{ cfs} \times \frac{3600 \text{ s}}{\text{hr}} = 23,000 \text{ ft}^3/\text{hr}$$

2) Volume of Proposed pond:

Trapezoidal cross sections  so take average widths:

$$65' \times 137' \times 5' = 44,525 \text{ ft}^3$$

3) Detention time:

$$T_D = \frac{44,525 \text{ ft}^3}{23,000 \text{ ft}^3/\text{hr}} = 1.94 \text{ hours}$$

or 1 hr 56 min

* During peak flow of 2Syn storm

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CIRCLE 1
4-16-12
F.T.H.

LOWER SILTATION POND

Drainage Basin Area, into catch basin, excluding ditch water from upper pond: 4.78 Ac

$$Q = C i A$$

Calculate flow from this drainage area

$C = .35$ for pastureland, over 10% - hill.

$i = 1.9$ inch 20 min travel time & 25 yr storm

$A = 4.78 \text{ Ac}$

$$Q = (.35)(1.9)(4.78) = 3.18 \text{ cfs.}$$

Flow into the lower "catch basin" & pipe into pond is total of flows from lower drainage area plus flows from upper pond:

$$(2.16 \text{ cfs}) + (4.02 \text{ cfs}) + (2.37 \text{ cfs}) = \underline{\underline{7.57 \text{ cfs}}}$$

Size pipe from "catch basin" into lower pond:

(From "Drainage System Design" catalog)

$$I.D. = \sqrt[2.67]{\frac{1.48279 Q}{S^{1/2}}}$$

$Q = 7.57 \text{ cfs}$ and (from the plans, slope @ 22.5%) $S = .225$

$I.D. = 11.26"$; but to allow for sediments, self-cleaning, etc.,

go with an 8" pipe, same as others on upper pond.

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Lower Pond Detention Time

$$T_D = \frac{V}{Q}$$

Volume of pond:

Ave width $\rightarrow 84 + 24 \div 2 = 54'$

Ave length $\rightarrow 164 + 104 \div 2 = 134'$

Depth $\rightarrow = 10'$

$$(54') \times (134') \times (10') = 72,360 \text{ cu ft}$$

$$T_D = \frac{72,360 \text{ cu ft}}{9.57 \text{ cfs}} \times \frac{1 \text{ min}}{60 \text{ sec}} = 126 \text{ min or 2 hrs, 6 min}$$